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NEW SPECIES OF NORTH AMERICAN EPHEMEROPTERA WITH CRITICAL NOTES.*

BY J. MCDUNNOUGH,

Ottawa, Ont.

In the present paper, besides descriptions of a few species which appear to be undescribed, I offer some critical notes on certain statements made and conclusions arrived at by Dr. Jay Traver in the taxonomic portion of Needham's *Biology of Mayflies*. The proof of the pudding is in the eating, and the value of a work such as the above can only be ascertained by constant checking of the keys and descriptions in connection with the examination of typical or topotypical material. There is undoubtedly a great deal of excellent matter in this portion of the volume but unfortunately I have noted also distinct evidences of that superficial and inaccurate type of work which, very sad to relate, we are becoming accustomed to associate with the Needham school. As a publication of this nature is bound to be considered, when used by students, as more or less authoritative, I propose from time to time, whenever my attention is drawn to these inaccuracies in the course of my work on the order, to offer short notes on the subject with a view to facilitating the correct identity of the species involved.

***Ephemerella bicoloroides* n. sp.**

Male. Scarcely separable from large *bicolor* in size and coloration. In general the abdomen is dorsally rather deeper brown in color, more as in *minimella*, ventrally shaded with light brownish with the curved row of dark dots on each of segments 1-8 quite distinct. The genitalia appear to be quite similar to those of *bicolor*. The legs are somewhat deeper yellow in color than in *bicolor*. Length of body and forewing, 7 mm.

Female. Head decidedly darker in color than in *bicolor*, being largely shaded with light brown and with scarcely any of the pale yellow shades found in this latter species. Thorax and abdomen are a richer brown than in *bicolor* and the legs are perceptibly deeper yellow.

Nymph. At once distinguished from *bicolor* nymphs by the much greater length of the dorsal abdominal tubercles, especially the pairs on the first four segments; these, while of the same bluntly rounded form, are fully twice as long as the same pairs in *bicolor*, their length being about equal to the distance between the individual tubercles of each pair. The posterior, more pointed, tubercles are also longer and the abrupt extension of width between the individual tubercles of each pair is also noticeable (as in *bicolor*) but possibly slightly less pronounced. In other details the nymph agrees with that of *bicolor*.

Holotype—♂, Baddeck Forks, Cape Breton Is., N. S., July 3, 1936 (J. McDunnough) (reared from nymph); No. 4290 in the Canadian National Collection, Ottawa, Ont.

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

Allotype—♀, same data.

Paratypes—12 ♂, 12 ♀, same data (mostly reared).

The nymphs were plentiful in the small streams around Baddeck in the quieter trickles of water, partially separated from the main current by the fall of the water-level. The black subimagos emerged between 3 and 4 p.m. and could then be found sitting on the small stones at the water's edge for a few minutes, preparatory to taking flight.

Ephemerella vernalis Banks. Dr. Traver disagrees (p. 627) with my placement of *vernalis* as a synonym of *rotunda*, on the grounds that a male paratype before her shows fewer spines on the penes than is found in *rotunda*; she gives *vernalis* priority over *inconstans* Trav. However, I would point out that my conclusions on the synonymy (1931, Can. Ent. L XIII, 195) were also based on the study of the genitalia of a paratype of *vernalis* and in fact my figure (Pl. XI, fig. 3) was actually drawn from the paratype slide; the characteristic spines on the ventral surface of the penes are certainly present. It is possible that the type series of *vernalis* Banks included specimens of both *rotunda* Morg. and *inconstans* Trav. as both occur in North Carolina (1937, Jour. Eli. Mitch. Sci. Soc., 67) but this can only be decided by a study of the genitalia of the actual type, and for the present I believe the best plan is to retain the synonymy as indicated by myself and restore *inconstans* Trav. as a good species.

In this connection I would point out that Traver's genitalic figures in this group (fig. 152) are very poorly drawn; they show no differentiation between dorsal and ventral surfaces and are inaccurate in the finer details, possibly due to poor technique in the matter of slide-making. The figure of so-called *vernalis* is evidently a slightly emended copy of a previous figure of *inconstans* (1932, Jour. Eli. Mitch. Sci. Soc. 149, Pl. IX, fig. 23) and that of *rotunda* could easily pass for *invaria* Wlk. as no indication of the medio-ventral spines is given and this to my mind, after the examination of more than 20 slides of *invaria* genitalia, is still the best point of distinction between the two species; both show the apical spines as indicated in Traver's figure of *rotunda* but, in spite of the known variability in the number of spines in the various areas, I have yet to find these medio-ventral spines in the true *invaria*.

With regard to *inconstans* Trav. I have made a genitalic slide from a male Paratype in alcohol, received from Dr. Traver; in contradistinction to Traver's figure (under *vernalis*) my specimen shows 2 apico-ventral spines on one side and none on the other and there is a single medio-ventral spine on the same side; the distribution of the other spines is about as in the figure. A comparison between the specimen of *inconstans*, thoroughly faded by its long immersion in alcohol, and our dried paratype of *vernalis* is quite impossible and I do not believe that Traver's key-characters can be taken too seriously. The species is probably a good one as species go in this group but one must await fresh pinned material of both forms before accurate differentiation is possible.

Genus *Baetis* Leach

Traver's key to the species of this difficult genus will have to be employed with considerable caution. The use of the presence or absence of the 3rd vein on the secondaries in the second caption as a means of differentiation is liable to cause trouble at an early stage of key-usage and has resulted in at

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least two species being thrown entirely out of their proper relationship. I refer to *bicaudatus* Dodds and *frondalis* McD. The former, it is true, shows very little sign of a 3rd vein in the female sex but this vein is present in most males, although weak and close to the wing-margin; the whole relationships are with the *moffati* group and it should be keyed accordingly. On the other hand *frondalis*, with its basal spine and penis-sheath, has nothing in common with the *moffati* group; vein 3 is never indicated in more than the faintest manner and is generally (as my longer series now permits me to state) to all intents and purposes absent, and the species would in consequence key to caption 8, where it really belongs. There is further an entire misidentification of *lasallei* Banks; this species, after a careful examination of the type, I decided to be so close to *intercalaris* McD. as to scarcely warrant a separation; it has certainly nothing to do with the *moffati* group.

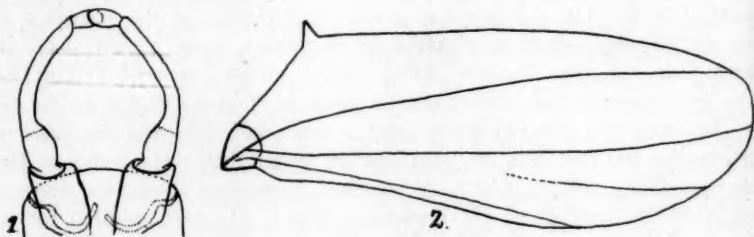
At the present time it is a rather risky undertaking to describe new western species in the *moffati* group until topotypical series, representing the various names involved, can be secured and studied; as this procedure, however, is likely to entail very considerable delay, I venture to describe as new a species which does not seem to fit in well with any existing descriptions; even should the name be found later on to fall to some previously proposed one it will at least have served its purpose in being definitely applicable. This species is evidently closely allied to *moffati* Dodds and probably also to *parallela* Banks; of the former I have before me, besides a male of the type lot in alcohol, three pinned males from Tolland, Colo., the type locality. From a study of this material I find Dodds figures quite accurate but cannot say the same of Traver's figure of the hindwing (fig. 163); in this figure the wing is much too wide and the upper and lower margins too rounded; the wing appears larger than that of *vagans* McD., which is certainly not the case. Of *parallela* I have no topotypical specimens but, through the kindness of Dr. Banks to whom I submitted material for comparison with his type, we have been enabled to tie the name rather definitely to a series from Yellowstone National Park, collected by me in late July, 1928. Based on this comparison I am assuming *parallela* to be a species paler in color of both thorax and legs than the one described below, but agreeing in the possession of a single intercalary on the hindwing.

***Baetis jesmondensis* n. sp.**

Male. Eyes (dried) rather small (very slightly larger than in *moffati*), blackish with ruddy tinges, especially along rim. (In alcohol material strongly binocular, the height about two-thirds of width, deep reddish orange). Head and thorax shiny black-brown; a distinct pale yellow spot on the antero-lateral edge of mesothorax, which color frequently extends caudad as a fine line along margin; a brownish spot anterior to the scutellum and the postero-lateral edges in this area shaded with brown; metathorax with anterior edge shaded with brown and with the anterior median projection tipped with creamy. Pleural sutures rather strongly tinged with ruddy, except a couple of pale creamy areas anterior to base of forewing. Abdomen with segments 1-6 dorsally rather uniformly semi-hyaline smoky-brown with a ruddy tinge laterally when viewed by transmitted light; the posterior edges of segments narrowly and obscurely pale,

giving a faint ringed appearance and anterior to this pale margin is a faint dark-colored transverse line, showing a ruddy tinge. Segments 7-10 opaque, deep russet brown. Ventrally the anterior segments are paler in color than dorsally but still distinctly smoky with slightly paler posterior edges; segments 7-9 colored as above with narrow creamy shades along posterior and lateral margins. Forceps pale creamy with slight smoky tinges apically. Setae pale. Legs with femora light smoky brown, tibiae and tarsi paler. Wings hyaline with veins faintly brown-tinted, especially in costal $\frac{1}{2}$ of primaries; intercalaries of primaries moderately long but practically lacking in first costal interspace; secondaries (fig.) resembling *moffati* in size and shape and number of veins, but with a single well-defined intercalary between veins 2 and 3 and with vein 3 better developed and longer, extending to fully two-thirds length of ventral margin; veins 1 and 2 bending very little towards each other at outer margin. Length of body 6 mm.; of forewing $7\frac{1}{2}$ mm.

Female. Thorax browner than in male but with similar maculation. Head back of the ocelli bright russet-brown, paler along margins of eyes and shaded with black along posterior edge which shows a slight median excavation. Abdomen decidedly ruddier than in male. Cross-veins on primaries heavier and deeper brown than in other sex.



Baetis jesmondensis n. sp. 1. Male genitalia. 2. Hindwing.

Holotype—♂, Jesmond, B. C. (Porcupine Cr.) September 12, 1937 (J. K. Jacob); No. 4291 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—18 ♂, 14 ♀, same data. Also a vial of alcohol material. The whole series captured as subimagos in late afternoon of September 10.

The distinctly blackish thorax should separate the species from other members of the group except *moffati*, and from this species the different hindwing venation may apparently be used as a means of separation, although on rare occasions the intercalary in *jесmondensis* is considerably reduced in length and like every other character in the Baetids not entirely constant. It might be noted that at times there are traces of granulations between veins 1 and 2 of secondaries and also adjacent to the distinct intercalary but so obscure as to be practically negligible, and I do not consider them as definite intercalary veins. In the male genitalia (fig.) I can see nothing which would satisfactorily separate the species from its allies.

Centroptilum victoriae n. sp.

Belongs in the *bifurcatum-semirufum* group, characterized by the presence of a small spine in the male genitalia between the basal joints of the forceps; very close in genitalia to *semirufum* but noticeably smaller in size; neither the spine between the forceps-bases nor the tubercle on innerside of second forceps-joint (fig. 7) is so prominent and there is no slight swelling at base on inner side of third forceps-joint as in *bifurcatum*.

Male. Eyes (dried) appear as flat blackish-red disks, with a brighter red outer rim. Thorax deep brown, somewhat deeper than in *bifurcatum* and almost as deep as in *conturbatum*, with latero-anterior and posterior edges of mesothorax shaded with creamy and the scutellum of metathorax tinged with same pale color; sutures of pleura considerably paler brown. Abdomen with first six segments hyaline white, without the yellowish tinge usually found in *bifurcatum* and more the color of *conturbatum*. A faint pinkish geminate hair-line and traces of small lateral patches of same color dorsally on segments 2-6; posterior margins of segments 2 and 3 very narrowly, and of 4 broadly edged with pinkish, the color on this latter segment forming a broad band, connecting the two lateral patches; a fine broken black hair-line in spiracular area. Segments 7-10 chocolate brown, margined laterally with cream-color. Ventrally segments 1-6 hyaline, 7-9 opaque creamy with faint brown shading laterally on 9. Tails white. Wings hyaline; secondaries with well-developed basal hook and two longitudinal veins; somewhat narrower and shorter than in *bifurcatum*. Legs white with faint ochreous tinges in apical portions of femora. Length of body 4 mm.; of forewing 4 mm.

Holotype—♂, Inhabitants Riv., Cape Breton Is., N. S., at junction of Victoria Highway, June 19 (J. McDunnough); No. 4288 in the Canadian National Collection, Ottawa.

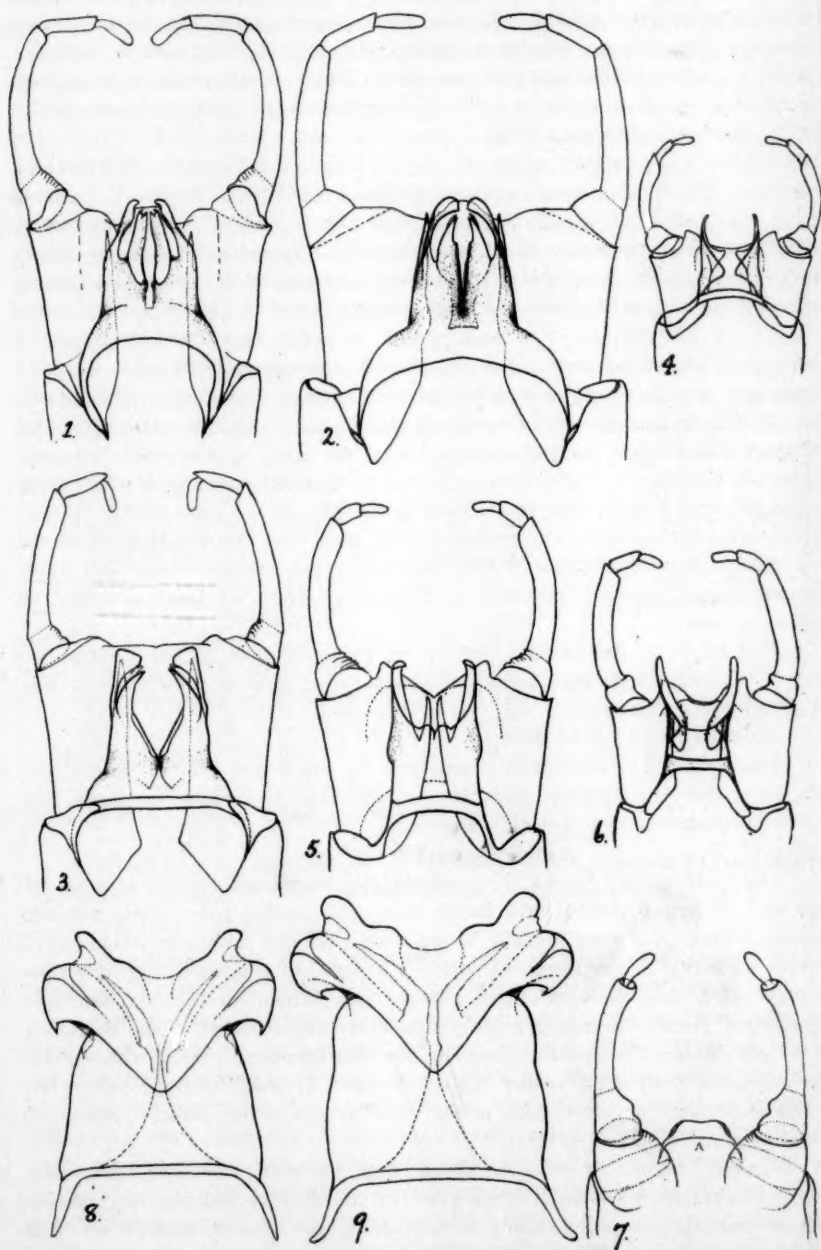
Paratypes—3 ♂, same data.

Distinguished at once from *semirufum* by the deeper-colored thorax, the much more restricted ruddy suffusion on the pale abdominal segments and the more chocolate-brown posterior segments.

Ameletus tertius n. sp.

Male. Head and thorax shiny pitch-black, tinged with ruddy at bases of wings and in pleural sutures and faintly with a somewhat paler shade anterior to the scutellum. Abdomen dorsally brown with a decided orange or ruddy tinge, the color somewhat deeper along the posterior margins of segments; ventrally considerably paler, dull, dirty ochreous, shading into brown on the last segment; no ganglionic marks; forceps base paler than preceding segment. Legs deep amber or pale brown, the femora, especially on the fore-legs, tinged with ruddy. Wings hyaline, with faint amber tinge, strongest in basal section; veins and cross-veins brown, the latter faint in the costal region before bulla. Length of body 9 mm.; of forewing 9 mm.

Female. Somewhat paler on thorax than the male, the color being deep brown, rather than pitch-black with more extended paler shading on anterior hump of mesothorax and anterior to scutellum; the pleural sutures are dull brown without the ruddy tinge. Head deep brown, shaded with dull clay-brown along margin of eyes and at vertex, which is narrower than in *ludens*. Abdomen



NORTH AMERICAN EPHEMEROPTERA

deep brown, the posterior segments somewhat paler both dorsally and ventrally, with, however, heavy deep brown lateral shading on the ninth. Anal plate about as long as tenth segment, scoop-shaped, with truncate posterior margin about $\frac{1}{2}$ the anterior one. Wings less tinged with amber than in male.

Nymph. Thorax variegated with brown and white. Abdomen dorsally with segments II, VII and VIII largely white, marked with brown along the anterior margin and in the case of VIII also in the posterior section. Segments III-VI brown with three prominent white spots, one centrally and two submedianly; there is also a white patch antero-laterally and the edges of segments are broadly white except in postero-lateral angles. Segments IX and X brown, the former with rather vague pale triangles based on anterior margin. Ventrally pale with segments IX and X largely dark brown, IX with two triangular pale patches on anterior margin; a median brown stripe on VIII which at times is indicated on VII and VI as dark dots on anterior margin. Tails white broadly banded in the median area with deep brown. Legs pale, femora with a median brown patch and a small spot at apex; tibia and tarsus tinged with brown at base. Gills pale with indistinct tracheation; dorsal edge with chitinous thickening in central portion; not extending full length of gill.

Holotype—♂, Baddeck Forks, Cape Breton Is., N. S., July 13, 1936 (bred from nymph); No. 4287 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—1 ♂, 3 ♀, same data, July 2, 9, 11; 1 ♂, 1 ♀, Hunter Mt. Creek, Baddeck, N. S., July 5, 6; all bred from nymphs.

The nymphs were found to be not uncommon by myself and my assistant, Mr. T. N. Freeman, in the numerous small brooks of the Baddeck region, occurring along the edges under small stones and swimming quite actively; they are rather difficult to bring to maturity. They are most closely related to the nymph of the western *validus* McD., but are at once separable by the banded tails. It was this same nymph that was recorded by me as *Ameletus* sp. from the North Shore of the Gulf of St. Lawrence (1932, Can. Ent. LXIV, 80). On male genitalic characters (fig. 6) the species seems to fall closest to the western *connectus* McD., but differs in the finer details quite considerably.

Ameletus querulus n. sp.

Male. Head deep brown. Pro and metathorax rather smoky brown with mesothorax rather bright yellow-brown with the scutellum decidedly tinged with orange and some smokier shading laterally; pleura rather paler brown with considerable pale areas at wing-bases. Abdomen with segments 2-6 semihyaline, light yellow-brown shading into deeper brown along posterior borders and rather strongly marked with fine dark tracheation arising from a dark lateral band; the opaque posterior segments 7-10 are only slightly deeper in color than the anterior ones and show a certain amount of lateral darker shading. Ventrally considerably paler, whitish, suffused with rather dull smoky with no trace of ganglionic marks. Legs light brown or amber-brown, fore-legs somewhat deeper in color than others. Wings pale hyaline with brown longitudinal veins and colorless cross-veins, these being practically invisible except in pterostigmatic area. Length of body 7 mm.; of forewing $7\frac{1}{2}$ mm.

Nymph (described from exuvium). Prothorax with two distinct pale spots on each side of median line; mesothorax marked with several large whitish comma marks. Abdomen dorsally with segment II pale, with antero-median dark blotch; segments III-VI dark with two pale submedian spots in central area, and one near antero-lateral angle; anterior half of lateral margin pale, continued inwardly as an inner border to a triangular dark postero-lateral area. In addition segment III has a pale antero-median spot. Segment VII pale with large antero-median hemispherical dark patch, below which in median line is small dark spot; a lateral dark streak and extreme latero-posterior angle dark. Segment VIII with dark areas more extended and enclosing two large, oblique, pale, submedian areas; lateral portions of segment pale. Segments IX and X entirely dark brown, the former with two small pale spots near antero-lateral angle. Ventrally segments I-VII pale, VIII and IX dark. On segments I and II two dark submedian spots, much larger on II; on III-VI these spots become progressively larger, uniting with dark shades on anterior margin to form large irregularly triangular patches, occupying the whole median area and with their apices touching the posterior margins of segments in the median line; faint lateral dark patches on III-V also become progressively larger and on V connect with the dark median area. No lateral blotches on VI. On VII the dark triangular patch is reversed and based on the posterior margin instead of the anterior one. Gills oval with a narrow dark band of chitin well within dorsal edge and reaching only two-thirds distance to tip of gill. Tails pale with moderately wide dark band across middle. Femora pale, tipped with dark and with small median oval dark spot.

Holotype—♂, Trepanier Cr., Peachland, B. C., July 20, 1934 (A. N. Gartrell); (bred from nymph); No. 4292 in the Canadian National Collection, Ottawa.

In coloration the species is rather similar to *cooki* and the nymphal characters would place it in this group. The genitalia are very similar to those of *shepherdi* Trav. as illustrated (fig. 117) by Traver but the wings show none of the amber tinges of this species and the nymph is apparently quite differently marked.

***Ameletus falsus* n. sp.**

Male. Very similar to *aequivocus* McD. (which occurs in the same region) but rather larger and at once distinguished by the presence of dark ganglionic spots on ventral surface of abdomen.

Head shiny pitch-black, clay-colored anteriorly next the eyes. Thorax deep shiny black-brown; mesothorax with slight clay-color shades anteriorly and with obscure ruddy brown shading anterior to the deep black scutellum (on the whole darker than in *aequivocus*); metathorax with brown shading anteriorly. Pleura brown, shaded with clay-color, especially at bases of legs; the sutures are somewhat paler but there is none of the large pale area, anterior to base of forewing, found in *aequivocus*. Abdomen dorsally with approximately the anterior $\frac{1}{2}$ of the first six segments pale, hyaline, the posterior portion being deep sepia brown with fine network of dark tracheation, but no definitely sharp line of demarcation between the colors, although a distinctly banded appearance is presented. Segments VII-X opaque, light ochre-brown anteriorly,

shaded heavily in posterior half with deep brown and with the lateral margin pale brown, especially on IX. Ventrally segments II-VI pale hyaline, segments VII-IX largely light ochreous; *a median row of black ganglionic marks.*

Forelegs deep pitch-black, other legs dull brownish with some deeper shading on femora in apical half. Wings pale hyaline, with distinct deep brown veins and cross-veins, except in the costal and subcostal region before bulla, where, with the exception of the large basal cross-vein, these latter veins are colorless. The genitalia (fig. 5) are quite similar to those of *aequivocus* but the penes are wider apart, the second joint of the forceps is much longer and less bent, and the forceps-plate is considerably longer, with the posterior projections less developed and closer together. Length of body $9\frac{1}{2}$ mm.; of forewing $9\frac{1}{2}$ mm.

Holotype—♂, Greer, Ariz., June 14, 1936 (G. & J. Sperry); No. 4293 in the Canadian National Collection, Ottawa.

Parameletus chelififer Bngsstn. A series of two males, three females of this northern European species were secured by Mr. W. J. Brown (July 4-6) at Churchill, Man. in the summer of 1937; this name will therefore have to be added to our North American List. The male genitalia agree excellently with Bngsstn's figure (1930, Lunds Univ. Arssk. N. F. Avd. 2, Bd. 26, p. 14, fig. 19). I give figures (figs. 2, 3) for the purposes of comparison of this species and *midas* McD.; my original figure of this latter species was very crude and drawn from a dried specimen; the figure in Needham's Biology of Mayflies (fig. 128) gives also an erroneous impression, as it was evidently made from a very much crushed and flattened-out preparation.

Parameletus columbiae n. sp.

Male. Head smoky black. Thorax shiny pitch-black, with slight light brown marks on mesothorax anterior to scutellum; sutures of pleura and the portion anterior to wing-base light brown with slight ruddy tinges; a brown patch at base of each leg. Abdomen deep brown dorsally, paling somewhat along anterior border of each of the first six segments; the four opaque posterior segments are shaded, especially laterally, with lighter brown; no evident markings, but traces of submedian longitudinal dark streaks, especially on posterior segments. Ventrally much the same in color as dorsally, but somewhat ruddier; the posterior margins of the anterior segments bordered narrowly with dirty white, giving a faint ringed appearance. Forceps smoky, basal plate largely dull ochreous with a V-shaped mark of same color on the central portion of segment 9. Tails smoky, paler at joints. Legs smoky brown, the tibiae and tarsi of prolegs almost pitch-black. Wings hyaline with deep brown longitudinal and cross veins. Length of body and forewing, 11 mm.

Female. Rather paler in color than the male, with more ruddy tinges on abdomen. Head rather dull dirty ochreous, about the same color as the legs; anal plate short, about one-half the length of segment 10, considerably narrowed apically and evenly rounded.

Holotype—♂, Dunn Peak, N. Thompson Riv., B. C., Aug. 10, 1937 (J. K. Jacob); No. 4289 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—23 ♂, 20 ♀, same data, Aug. 10 and 11.

This species is apparently very close to the European *minor* Bngsstn., but is much larger in size and in the male genitalia (fig. 1) differs in the narrower width of the truncate medio-posterior projection of the basal plate of the forceps. According to Mr. Jacob's report the series was captured at an altitude of 7,000 ft. the males swarming high in the air over a small glacial stream and the females flying over the water.

Iron pleuralis Banks. In the systematic section of Needham's Biology of Mayflies, Dr. Traver (p. 407) makes the statement, on the strength of the examination of a paratype in alcohol, that this species has heretofore been misidentified and that the male genitalia, of which she gives a figure (fig. 106), are of a type totally distinct from those of other eastern species. An examination of this figure left considerable doubt in my mind as to the correctness of this statement. It seemed to me that the drawing had been made from a dried or alcoholic specimen in which the penes had been dorso-ventrally twisted and consequently distorted; such distortion occurs at times in males of the genus *Cinygmula* as has already been noted (Can. Ent. LX, 239). To clear the matter up I made a slide (after maceration in caustic potash) of the genitalia of a male from Ringwater Cr., N. Y. sent me by Dr. Traver as the true *pleuralis* and which in its dried condition matched very well with figure 106; as suspected the genitalia, in their normal position, proved to be of the ordinary *longimacrus* type, and identical with a genitalic slide made from a male paratype of *fraudator* Trav.; other slides of similarly distorted specimens amongst our Canadian series gave similar results.

Owing to her erroneous conclusions regarding *pleuralis*, Traver proposed the two names *confusus* (p. 398) and *fraudator* (p. 402), the latter to take the place of the *pleuralis* of Ide and myself and the former for a so-called new species, poorly defined, and separated from *fraudator* largely on the paler coloration of thorax and abdomen and the finer venation; a feature which may largely depend on the grade of maturity of the individual adults. Of both of these so-called species I have male paratypes before me, and slides of genitalia show such close resemblance as to leave considerable doubt in my mind as to the specific validity of both names. In these two slides (fig. 8 and 9) the main difference seems to be in the position of the apical spine or thorn which terminates the upper outer portion of each penis; in the one case (*fraudator*) these spines are directed inward, pointing more or less towards each other, whilst in the other case (*confusus*) they project cephalad in more or less parallel directions. This difference, it appears to me, (after examination of about twenty slides of our Canadian material, prepared as carefully as possible to avoid distortion) is due largely to the position of the penes on the slide and is individual rather than specific in character; at the best it seems to me we are dealing merely with slight variants or phases of a single species. It should, however, be pointed out that the name *fraudator*, based on specimens of the larger, darker form, is scarcely applicable to our Canadian species as claimed by Traver; our long series from Knowlton, Que., various localities in the Ottawa region and from the Maritime provinces agree genitally and in every other way with *confusus*. At once the question arises as to which of these names (if we are not willing to sink both) falls to *pleuralis* Banks; the type locality of the species is Gloversville, N. Y., an Adiron-

dack locality, and it seems reasonable to conclude that our Knowlton specimens, from a very similar region, would be the same, especially as odd specimens before me from New Hampshire, Massachusetts and the Catskills, N. Y. also fall here. Based on this supposition (and it is one that can only be definitely proven or disproven by a careful study of the type) I would retain the name *pleuralis* Banks with synonym *confusus* Trav. for our Canadian species, leaving *fraudator* as very doubtfully distinct for the present and applied to the larger, darker form from more southerly regions.

With regard to the nymphs the distinctions given by Traver to separate those of *confusus* and *fraudator* are open to the same criticism of inadequacy as was the case with the adults; the main difference seems to be in the presence (*fraudator*) or absence (*confusus*) of dark submedian streaks on certain abdominal sternites, other distinctions given in her key (p. 307) being refuted in her most recent paper (1937, Jour. El. Mitch. Soc. 53, 56); such a character is to my mind too evanescent for specific separation. I have examined long series of nymphs from the same Canadian localities as cited above, including further some of Ide's material on which his drawing was based (Can. Ent. 62, 228); in all this material the cephalic section of the first gills is strongly produced and somewhat lunate, the position being very variable according to the way the gills were placed when the nymph hardened in alcohol; in some this position was more or less parallel to the lateral edges of the abdomen, in others the gills were produced beneath the abdomen, their apices practically touching the median line; such differences, however, seemed purely individual, the two extremes being connected by all manner of intermediates. As regards the dorsal abdominal maculation most specimens, when fresh, show a median series of obscure, semi-heart-shaped, darkish patches, decreasing in size on the posterior segments and with the dark dots of Ide's figure scarcely visible within the lateral portions of the patches; after long submergence in alcohol these patches tend to disappear and the dots stand out in consequence much more strongly. The ventral maculation in our entire series consisted of a pair of more or less prominent small round submedian spots near the anterior margins of segments 7-9, those of the ninth segments tending at times to coalesce; very minute dark dots placed more centrally could generally be discerned but only very occasionally were there any traces of the lateral or submedian streaks mentioned by Traver for both *confusus* and *fraudator*. Judging by the remarks made by Traver in the article above cited (p. 56) it would seem that the ventral maculation becomes more intense and extensive as one proceeds south but such differences, I still maintain, are very liable to be caused by environmental conditions, and to make them the basis for specific differentiation is extremely risky.

Iron fragilis Morgan. The type adult of this species being lost Traver has based her determination of the species on the statements by Morgan and Needham that in the nymph the first pair of gills are produced and meet beneath the abdomen; in consequence, for the small species in which the well-authenticated nymph has a much smaller first pair of gills and which has heretofore gone as *fragilis*, she proposes (p. 412) the new name *tenuis*. However in a later paper

(*op. cit.* p. 57) some doubts seem to have arisen in her mind and she is inclined to associate the so-called nymphs of *fragilis* with *confusus* Trav. In this she is very likely correct, but as the name *fragilis* is definitely based on a male imago, the matter of possible misassociation of nymphs and adults is not vital; what is vital is Morgan's original description of the male adult and especially her figure of the male genitalia (Pl. X, fig. 4); if this figure be compared with Traver's of *tenuis* (fig. 105) the great similarity between the two is at once evident, and combining this with the fact that the description fits in much better with the smaller species of the two I can see no valid reason for not sinking *tenuis* Trav. as a synonym of *fragilis* Morg. It might be pointed out that the whole matter could have been easily and satisfactorily solved by breeding experiments at Ithaca and the troublesome synonymy thus been avoided.

Iron proprius Trav. This species, judging by the genitalic figure (fig. 106), is probably based on specimens of *longimanus* Eat. with distorted penes; it is a parallel case to that of *pleuralis* Banks, but as I have no material of *proprius* before me I shall have to leave it to Dr. Traver to make the proper correction.

Iron (Epeorus) albertae McD. (syn. *youngi* Trav.) Three new species, described by Traver—*lagunitas*, *sancta-gabriel*, and *youngi*—are all very closely related on genitalic characters to *albertae*. Concerning the first two I am not in a position to speak, lacking material, but with a male paratype, in alcohol, of *youngi* before me and also a small series of pinned specimens from the Yellowstone Park, Wyo. which undoubtedly agree, I feel pretty confident that *youngi* merely represents a darker and somewhat better marked *albertae*. There are absolutely no genitalic differences that I can see and it is incorrect that the dark markings on pleura and spiracular area of abdomen are absent in *albertae* as stated by Traver; in the holotype they are distinctly present, although I must admit that no mention of them was made in the original description; in the paratypes and other males before me these markings are traceable but of varying distinctness and tend to fade when the specimen had been too long in the cyanide jar; it is probable that the paratype specimen at Cornell is one of these faded specimens or a rather teneral one, as dark pleural marks, as well as the dark basal cross-vein, characterize the whole *humeralis* group.

I cannot check on the alleged differences in the lengths of the fore femora as these are lacking in the *youngi* paratype before me; however, I can find no tangible differences in femoral length between my pinned Wyoming and Alberta series and imagine that Traver's material, especially of *albertae*, was hardly adequate for her to form a correct opinion on this point.

There is no doubt that the thorax in *youngi* is very decidedly and constantly darker than in my series of *albertae*, but such differences in specimens of a single species occur quite frequently in the Heptagenines (*e. g.* *Stenonema tripunctatum*) and should not be employed as a basis for specific separation.

PLATE I

Male genitalia of 1. *Parametetus columbiae* n. sp.; 2. *P. chelifer* Bngsstrn.; 3. *P. midas* McD. (Holotype); 4. *Ameletus querulus* n. sp.; 5. *A. falsus* n. sp.; 6. *A. tertius* n. sp. 7. *Centropitulum victorae* n. sp.; 8. *Iron confusus* Trav. (Paratype); 9. *I. fraudator* Trav. (Paratype).

SOME NEW CANADIAN CHRYSOMELIDAE*.

BY W. J. BROWN,
Ottawa, Ont.

***Lema gaspensis* n. sp.**

Length 3.7 mm.; width 1.7 mm. Body form as in *palustris* Blatch. Black; the elytra with a greenish lustre, not at all bluish; the basal half of the head, antennae, and legs pale red; the basal segment and four terminal segments of each antenna distinctly infuscate; femora and the apical half of each terminal tarsal segment heavily infuscate.

Head very finely, sparsely punctulate and the front strongly bituberculate as in *palustris*. Pronotum much as in *palustris*, as wide as long, the median line with seven coarse punctures arranged in two irregular rows and with a punctiform fovea in the basal constriction; disk sparsely and very indistinctly punctulate at middle, roughened by a few unequal punctures on each side. Scutellum quadrate as in *palustris*. Elytra as in *palustris* but with the stria punctures distinctly coarser and fully as wide as the basal portions of the second and fourth intervals. Ventral surface indistinctly punctulate.

Holotype—Mt. Albert, Gaspe Co., Que., 3,000—3,250 ft., July 20, 1933, (W. J. Brown); No. 3645 in the Canadian National Collection, Ottawa.

The species is closely allied to *palustris*. In addition to the differences in color and in the elytral punctures, the antennal segments in *gaspensis* are shorter and stouter than in the other species. In Schaeffer's key to the species of *Lema* (1933, Jour. N. Y. Ent. Soc. XLJ, 305), *gaspensis* traces to couplet 11 or 13.

***Chrysolina hudsonica* n. sp.**

Very closely allied to *vidua* Rog. and *flavomarginata* Say, differing from those species only in size, color and sculpture. Length of holotype 5 mm., of male paratypes 4.4-5.3 mm., of females 5.2-6 mm. Black; the entire dorsal surface strongly aeneous; each elytron with the epipleuron and lateral and apical margins pale red; this lateral band usually occupying the external interval, sometimes narrower or obscure but the epipleuron always pale. Punctures of the head, pronotum, and under surface considerably finer and sparser and the elytral punctures considerably finer than in the allied species. Males usually less strongly alutaceous and therefore more strongly shining than females, with the antennae a trifle longer, and with the anterior and middle tarsi a trifle wider than the posterior; the females with the anterior and middle tarsi a little narrower, equal in width to the posterior pair.

Holotype—♂, Churchill, Man., July 23, 1937, (W. J. Brown); No. 4281 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, June 21, 1937.

Paratypes—35 ♂, 24 ♀, same data, June, July, and August, 1937; 1 ♀, East Coast of James Bay, Que., Sept. 6, 1920, (F. Johansen).

The pale elytral margin is less conspicuous and a little narrower than in *flavomarginata* from which the present species differs by its small size, strongly aeneous dorsal surface, and fine, sparse puncturation.

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

***Galerucella stefanssoni* n. sp.**

Female. Length 3.6 mm. Rather broadly oval, the form as in *vaccinii* Fall. Pale brownish-yellow above as in *spiraeae* Fall; labrum black; the head with a broad basal black band which almost attains the eyes; pronotum with a pale brown area at middle; scutellum blackish at base; meso- and metathorax beneath and abdomen black, the apical segment of the abdomen margined with yellow; antennae and legs pale, the apical segment of each tarsus brownish. Vestiture short and inconspicuous as in *luteola* Mull. Eyes much less prominent and antennae much shorter and stouter than in *spiraeae* and its allies; the antennae extending to basal fifth of the elytra, the tenth segment four-fifths as wide as long; the head feebly shining. Pronotum shining, with coarse, close punctures; the punctures nearly as coarse as those of the elytra; the impression on each side of the median line deeper than usual. Elytral punctures coarse as in *spiraeae* and allies, a little closer than in those species; the apical angle of each elytron not rounded. Terminal segment of abdomen not modified.

Holotype—♀, Langton Bay (situated in Franklin Bay), N. W. T., 1913 (V. Stefansson); No. 4165 in the Canadian National Collection, Ottawa.

Paratype—♀, same data.

The paratype measures 3.4 mm. The species is very strongly characterized. It was recorded as *decora* Say by Leng (1919, Rept. Can. Arctic Exped. III, 18E). In all of the native American species of *Galerucella* except this and *quebecensis*, the free inner margin of the elytral epipleuron gradually approaches and finally joins the outer margin near the apex of the elytron. In *stefanssoni* this inner margin remains distant from the outer and ends rather abruptly before the apex. The condition here approaches to a certain extent that seen in *luteola* Mull. in which the inner margin becomes evanescent a considerable distance before the apex.

***Galerucella quebecensis* n. sp.**

Male. Length 3.7 mm. Form as in *spiraeae* Fall. Color above dull brownish yellow as in *spiraeae*; head with a black spot at base; pronotum with a large blackish cloud at middle; each humeral umbone black, this spot continued posteriorly over three-fifths of the elytron to form a rather obscure, poorly delimited vitta; antennae blackish in apical half, in the basal half with part of each segment pale; metasternum and abdomen black, the latter largely yellow in apical half; legs yellow. Vestiture short as in *luteola* Mull. but closer as in *spiraeae*. Antennae as in *spiraeae* and allies. Head and pronotum moderately shining, more strongly so than in *spiraeae*, the punctures poorly defined; the impression on each side of the pronotal disk deeper than usual. Elytra coarsely punctate as in *spiraeae*; each elytron with the apical angle not rounded, minutely and very acutely prominent in the holotype but not so in some other specimens.

Male with the apical ventral segment broadly emarginate, the emargination deeper than in *spiraeae*; with a triangular excavation at apex, this similar to but smaller than that of *spiraeae*, occupying the apical two-fifths of the segment. Aedeagus symmetrical, less elongate and more strongly attenuate at apex than in *nymphaeae* L., with the apical portion feebly recurved.

Female. Last ventral segment broadly emarginate, the emargination less deep than in the male; with a punctiform excavation at apex, this occupying the apical fourth of the segment.

Holotype—♂, Knowlton, Que., June 14, 1928, (W. J. Brown); No. 4335 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—1 ♂, same data; 1 ♀, Duparquet, Que., June 18, 1937, (G. Stace Smith), on *Cornus*.

The specimens measure from 3.5 mm. to 3.8 mm. in length. As in *stefanssoni*, the free inner margin of the elytral epipleuron remains distant from the outer margin and ends abruptly near the apex of the elytron. The species is strongly characterized by the form of this margin and by the form of the aedeagus, of the female abdomen, of the elytral apices, and by the color and vestiture of the elytra.

***Galerucella ribicola* n. sp.**

Male. Length 4.3 mm. Very pale brownish yellow; the pronotum, antennae, venter, and legs without darker markings; the color a little paler than in *spiraeae* Fall. Body form and sculpture as in *spiraeae*. Male with the apical segment of abdomen excavate as in *spiraeae*; this segment not emarginate in the female. Aedeagus as in allied species. Food plant—*Ribes*.

Holotype—♂, Aweme, Man., June 3, 1924, on *Ribes*, (N. Criddle); No. 4164 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, May 19, 1919.

Paratypes—7, same data as holotype; 14, same data as allotype.

I have in addition three specimens reared at Aweme by Dr. R. D. Bird on *Ribes floridum* L'Her. It is evidently this species that has been recorded by Dr. Bird as feeding on currant and gooseberry in southern Manitoba (1927, Can. Ent. LIX, 127). On account of its very pale color, the species resembles *spiraeae* to which it is closely allied. It lacks the dark markings and modified female abdomen of *spiraeae*. It is less broadly oval and much paler than *vaccinii* Fall to which it traces in Fall's key (1924, Bull. 319, Maine Agr. Exp. Sta., 83). The paratypes of *ribicola* measure from 3.8 to 5 mm. The antennae are feebly infusate in some of the specimens, and in some females the apical portion of the median line of the terminal abdominal segment is very feebly impressed.

***Altica populi* n. sp.**

This species is very closely allied to *prasina* Lec. and to *ambiens alni* Harris. It agrees perfectly with the latter in size, color, and in the form of the elytral fold and can be distinguished only by characters of the aedeagus. The aedeagus of *populi* is indistinguishable from that of *prasina*. However, in *prasina* the elytral fold is a little better developed, the average size is slightly smaller, and the body above is usually more strongly alutaceous and less strongly shining than in *populi*. While *prasina* feeds on willow and *ambiens alni* on alder, *populi* feeds on the balsam poplar, *Populus balsamifera* L. It was very abundant in both larval and adult stages on poplars growing at Arnprior on the shores of the Ottawa river in 1936 and 1937. Adjacent willows were not infested. The holotype of *populi* measures 5.2 mm., the paratypes from 4.5 to 6.2 mm.

Holotype—♂, Arnprior, Ont., July 7, 1936, on *Populus balsamifera*, (W. J. Brown); No. 4163 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—81, same data, taken on various dates in July, August and September, 1936 and May, 1937; 13, Aweme, Man., May 30, 1919, on balsam poplar, (N. Criddle).

It is undoubtedly the present species that is discussed as a biological race of *ambiens alni* by Woods (1918, Bull. 265, Maine Agr. Exp. Sta., 270). Dr. Woods took beetles from balsam poplar at Veazie, Maine, which he found indistinguishable from *ambiens alni* in all stages. He found the life histories of the two forms the same except for a difference in egg laying habits. Caged larvae and adults from the poplar ate willow and alder readily, but those from alder consistently refused to feed on balsam poplar.

RESEARCH NOTES

UNUSUAL ABUNDANCE OF *CELERIO LINEATA* FAB. IN ONTARIO.

The great number of the pretty striped sphinx, *Celerio lineata* Fab., throughout Ontario during August and early September of 1937, has aroused considerable interest.

This sphinx is not often taken in Canada, and probably most specimens secured are stray visitors from the south, where they are described as the most common species.

In order to ascertain if possible the reason for the immigration, and its distribution within the province, a small campaign of enquiry was started, which has furnished much information. Mr. O. E. Booth, of Des Moines, Iowa, U. S. A., a collector of many years experience, remarks that they can be taken from late April until early October; that adults flying in the early spring tend to a smaller size than those flying in the summer. Those flying later in the summer are beautiful large specimens, measuring 3 to 3½ inches in wing expanse. This indicates, and there seems to be little doubt, that the species is double-brooded, especially in favourable localities and seasons.

Respecting our recent immigration, there appears to have been a great abundance of these moths in Montana and North Dakota. A tourist driving through North Dakota found it necessary to stop at intervals to clear them from the windshield. Mr. R. H. Ozburn, of the Ontario Agricultural College, Guelph, reports over fifty counted at a light on September 1st near the border of Montana and Dakota, and Mr. Lee A. Strong, United States Department of Agriculture, Washington, D. C. writes: "During 1937 it (*Celerio lineata* Fab.,) was very abundant from South Dakota and Minnesota eastward along the great lakes to Michigan, with an isolated report from the state of Maine. Enormous abundance from the states of Wisconsin and Michigan could easily account for heavy flights in Southern Ontario or even farther north."

A contributing cause may have been drought in the middle west. South Dakota, Nebraska, and Kansas have been afflicted with drought the past three years, so the natural tendency would be for the sphinx moths to migrate north

in search of food. Our late tropical summer, warm and moist, provided flowers of all kinds in profusion, and so tempted the visitation of the hungry army.

Distance is no great obstacle to these strong and rapid flying moths. Dr. Forbes of Cornell University mentions an interesting example of this attraction of flowers: "The most interesting case of its occurrence (*Celerio lineata* Fab.) I know of was in western Peru. About ten years ago there was a rain on the west coast of Peru (the first in thirty or forty years) and plants sprung up everywhere and blossomed, among them many deep tubed flowers. *C. lineata* immediately appeared. I have always supposed they flew in from neighbouring mountain areas, which would in that case be about fifty miles away. I can hardly believe that pupae as little protected as *lineata* could have remained dormant in the soil thirty years. Dr. R. C. Murphy of the American Museum reported them and saved specimens. I played with the idea that they might be a special desert race, but could see no difference between his specimens and New York ones."

In response to a questionnaire sent to our Ontario correspondents, asking for information about Hawk Moths in their district, over fifty replies were received, ranging from Kenora on the west, to Ottawa on the east, Windsor on the south to Moose Factory on the north. This tends to show the wide spread of the immigration. It would be tedious to mention them all, very few give any specific name, but the general remarks were: "Abundant in August"; "Many seen of variety unknown before," "Large numbers were seen about Sault Ste. Marie and district"; "Plentiful in Iroquois Falls, no one of many interested had seen them here before." Mr. C. H. Mounfield, Island Falls, Ontario, said: "Over 50 in our garden alone this summer." He sent three photographs of *C. lineata* Fab. on the flowers. Mr. John Raeburn, Kapuskasing, Ontario: "None seen until early August, when they suddenly became quite numerous around flower gardens for a few weeks, none seen in this locality in previous years." Royal Canadian Mounted Police, Moose Factory Detachment: "Several hawk moths seen at Moose Factory Post during August, 1937." I think it may be assumed that the moths seen were *C. lineata* Fab., as very few, if any sphinx, are on the wing in August.

C. lineata Fab. was very plentiful in and around Toronto. Mr. Fred Urwin took forty specimens on petunias in his garden. Mr. Edward Watson captured twenty but was disappointed that he was unable to obtain any ova from the females. Paris and Hamilton contributed one specimen each, taken by Mr. M. Plumley. Mrs. Whittemore found them numerous in Muskoka, feeding on Jewel Weed, and also coming freely to light. Mr. Fred Urquhart reported them as very abundant in the Ottawa district. It seems that enquiries about identity were frequent at Ottawa, Guelph, etc.

Mr. E. V. Rippon reports the species as numerous in Toronto in 1885 and 1886. Previous specimens in the Museum there are: Toronto, Sept. 2nd, 1899, C. W. Nash Collection; Toronto, June 12th, 1880, Dr. Wm. Brodie Collection; Toronto, Sept. 21st, 1895, Dr. Wm. Brodie Collection; Toronto, Sept. 13th, 1908, Dr. A. Cosens Collection; Timmins, Ontario, 1935, Mr. H. W. Darling; and Algonquin Park, Ontario, Aug. 19th, 1935, Mr. Clarke.

C. E. CORFE,

Royal Ontario Museum of Zoology.

NEWS AND VIEWS

DEATH OF DR. G. H. F. NUTTALL.

Dr. G. H. F. Nuttall, Emeritus Professor of Biology at Cambridge, England, died suddenly in London on December 16th, 1937, at the age of seventy-five years. With an international reputation for his accomplishments in bacteriology, parasitology, hygiene, and physiology, his practical contributions to mankind will remain as a lasting testimonial. With his friend, the late Sir Patrick Manson, he did a very great deal to stimulate work on the nature and prevention of parasitic diseases.

Showing that blood and other body fluids possess the power of killing bacteria he provided a basis for all work on anti-toxin sera. His discovery of the precipitin test provided medico-legal experts with a sure method of identifying the nature of minute traces of blood, whether man or animal. But perhaps his greatest work was the long series of studies of insects as carriers of bacterial and parasitic diseases in man and animals. In conjunction with the late Sir Arthur Shipley he published a series of articles on the structure of the mosquito, which are a model of their kind. His investigations of ticks responsible for disease transmission are also well known and during the world war he turned to the study of lice infesting man and methods of combating this infliction among the troops. In conjunction with Welch he discovered the bacillus causing "gas gangrene."

Founder and editor of the *Journal of Hygiene* in 1901 and of *Parasitology* in 1908, Fellow of the Royal Society, Sc.D. of Cambridge and honorary doctor of five other universities, he conducted investigations on behalf of the British Ministry of Health, the Royal Army Medical Corps, and the Government of South Africa. He received the Legion of Honour and the Belgian Order of Leopold II. The secret of Dr. Nuttall's success was his untiring industry and attention to detail. Possessed of considerable personal charm one could not fail to recognize his generosity, his good will, and his strong senses of loyalty, sympathy, and personal honour.

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Ide, F. P., Dept. of Biology, University of Toronto, Toronto, Ont.
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McDunnough, J., Entomological Branch, Dept. of Agriculture, Ottawa.
McGuffin, C., R. R. No. 1, Ettrick, Ont.
McLaine, L. S., Entomological Branch, Dept. of Agriculture, Ottawa.
MacLeod, J. H., Dominion Parasite Laboratory, Belleville, Ont.
Macnamara, C., Arnprior, Ont.
Maheux, G., Department of Agriculture, Quebec, P. Q.
Maltais, J. B., Dominion Entomological Laboratory, Hemmingford, Que.
Martin, Rosemary D. C., Dept. of Biology, University of Toronto, Toronto, Ont.
Matthewman, W. G., 41 Monkland Ave., Ottawa.
Milnes, H., 759 Rathbone Ave., Woodstock, Ont.
Milne, L. J., 92 Quebec Ave., Toronto, Ont.
Mitchener, A. V., University of Manitoba, Winnipeg, Man.
Morrison, F. O., Macdonald College, Que.

- Ozburn, R. H., Ontario Agricultural College, Guelph, Ont.
Painter, R. H., Entomological Branch, Dept. of Agriculture, Ottawa.
Pass, H., Plant Inspection Office, Customs Building, Toronto, Ont.
Patterson, D. F., Entomological Laboratory, Vineland Station, Ont.
Patterson, N. A., Dominion Entomological Laboratory, Annapolis Royal, N. S.
Patterson, S. J., Plant Inspection Office, Halifax, N. S.
Peck, Oswald, Entomological Branch, Dept. of Agriculture, Ottawa.
Petch, C. E., Dominion Entomological Laboratory, Hemmingford, Que.
Peterson, L. O. T., Dominion Entomological Laboratory, Indian Head, Sask.
Petty, D. J., Plant Inspection Office, Niagara Falls, Ont.
Pickett, A. D., Woolfville, N. S.
Plomley, M., Apt. 12, "Ambassador", 362 John St. S., Hamilton, Ont.
Putman, W. L., Entomological Laboratory, Vineland Station, Ont.
Reeks, W. A., Dominion Entomological Laboratory, Fredericton, N. B.
Rempel, J., Regina College, Regina, Sask.
Ricker, W. E., Vedder Crossing, B. C.
Ross, W. A., Entomological Laboratory, Vineland Station, Ont.
Sanders, G. E., Sanders Insecticide Co., Jersey City, N. J., U. S. A.
Seamans, H. I., Dominion Entomological Laboratory, Lethbridge, Alta.
Shearman, A. E., 4401 W. 14th Ave., Vancouver, B. C.
Sheppard, R. W., Plant Inspection Office, Niagara Falls, Ont.
Short, S. H., Entomological Branch, Dept. of Agriculture, Ottawa.
Simpson, L. J., Dominion Entomological Laboratory, Fredericton, N. B.
Smallman, B. M., c/o University of Western Ontario, London, Ont.
Smith, C. W., Dominion Parasite Laboratory, Belleville, Ont.
Smith, D. N., 19 Alloway Ave., Winnipeg, Man.
Smith, J. M., Ontario Agricultural College, Guelph, Ont.
Stevenson, L., Ontario Veterinary College, Guelph, Ont.
Staddon, M., 509 California Ave., Sandwich, Ont.
Stirrett, G. M., Dominion Entomological Laboratory, Chatham, Ont.
Strickland, E. H., University of Alberta, Edmonton, Alta.
Swaine, J. M., Department of Agriculture, Ottawa.
Thompson, R. W., Ontario Agricultural College, Guelph, Ont.
Tinkham, E. R., Academy of Natural Sciences, Philadelphia, Penn., U. S. A.
Twinn, C. R., Entomological Branch, Dept. of Agriculture, Ottawa.
Troyer, Sprague, Reyort Biological Supplies, Toronto, Ont.
Urquhart, F. A., Royal Ontario Museum, Toronto, Ont.
Van Steenburgh, W. E., Dominion Parasite Laboratory, Belleville, Ont.
Vroom, P. W., Entomological Branch, Dept. of Agriculture, Ottawa.
Walley, G. S., Entomological Branch, Dept. of Agriculture, Ottawa.
Wallis, J. B., School Board Offices, William Ave., Winnipeg, Man.
Webber, R. G., Plant Inspection Office, Halifax, N. S.
Welsley, F. W., 150 St. John St., Quebec City, P. Q.
White, R. M., Dominion Entomological Laboratory, Lethbridge, Alta.
Wilkes, A., Dept. of Biology, University of Toronto, Toronto, Ont.
Wishart, G., Dominion Parasite Laboratory, Belleville, Ont.
Woods, A. A., Dominion Entomological Laboratory, Strathroy, Ont.

Wressell, H. B., Dept. of Biology, University of Toronto, Toronto, Ont.
Young, C. H., Biological Survey, Victoria Museum, Ottawa.

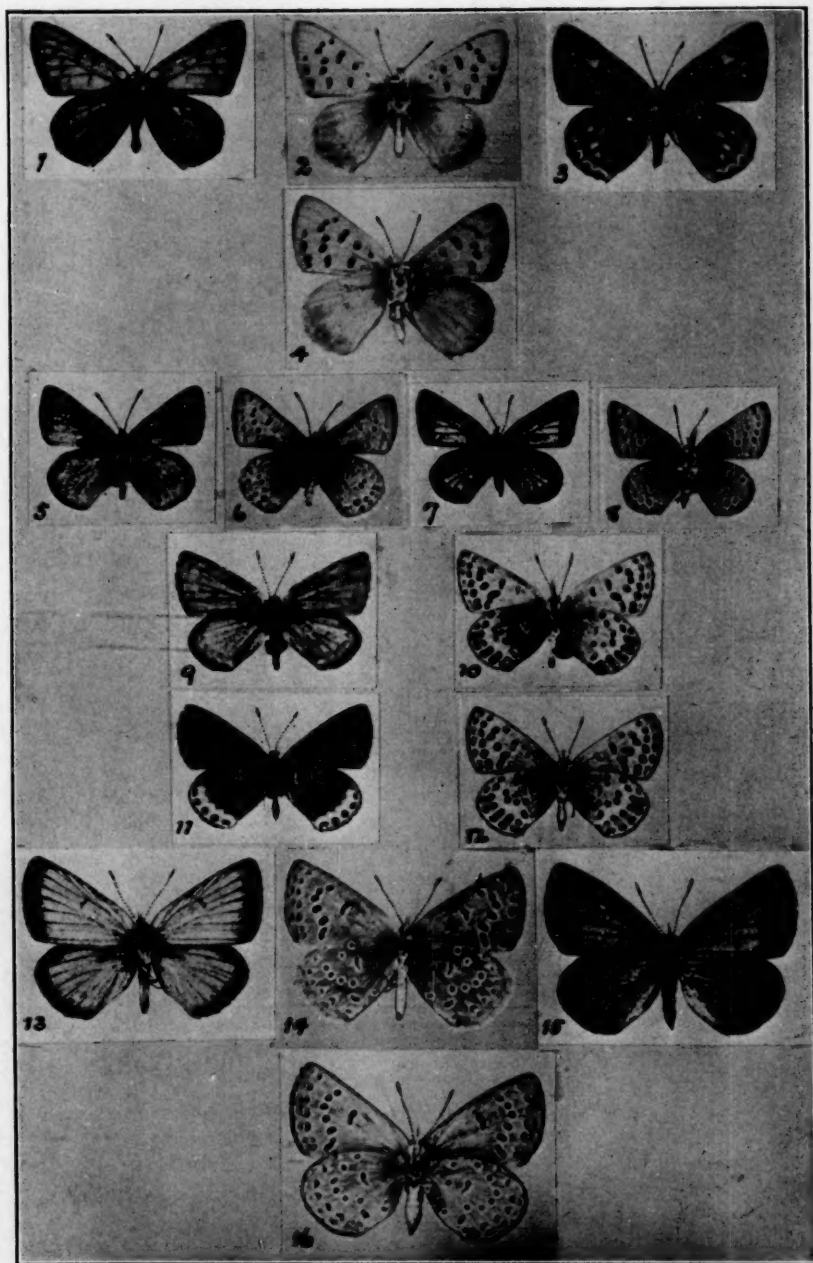
MEMBERS OF THE MONTREAL BRANCH

Beaudoin, N. P., Plant Inspection Office, Montreal, Que.
Beaulne, J. T., 3084 Dickson St., Notre Dame de Victoires, Montreal, Que.
Buckle, J. W., P. O. Box 2460, Montreal, Que.
Cameron, N., Plant Inspection Office, Montreal, Que.
Ghagnon, G., Dept. of Entomology, University of Montreal, Montreal, Que.
Fournier, Rev. Father O., Dept. of Entomology, Univ. of Montreal, Montreal.
Grieve, Mrs. E. G., 3647 Durocher St (Apt. 12), Montreal, Que.
Hall, G. H., 651 Querbes Ave., Outremont, Que.
Monro, H. A. U., Dominion Fumigation Station, Montreal, Que.
Moore, G. A., 359 Querbes Ave., Outremont, Que.
Munroe, E., 29 Bellevue Ave., Montreal, Que.
Ouellet, Rev. Bro. J., c/o Deaf & Dumb Institute, Montreal, Que.
Ryan, W. E., Plant Inspection Office, Montreal, Que.
Sheppard, A. C., 3126 Maplewood Ave., (Apt. 3), Outremont, Que.

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Buckell, E. R., Dominion Entomological Laboratory, Vernon, B. C.
Buckell, W. R., Salmon Arm, B. C.
Crumb, S. E., Box 233, Puyallup, Washington, U. S. A.
Downes, W., Dominion Entomological Laboratory, Victoria, B. C.
Foxlee, H. R., Robson, B. C.
Getzendaner, C. W., Box 30, Puyallup, Washington, U. S. A.
Glendenning, R., Dominion Entomological Laboratory, Agassiz, B. C.
Gregson, J. D., Dept. of Entomology, Univ. of Alberta, Edmonton, Alta.
Hanham, A. W., Duncan, Vancouver Island, B. C.
Holland, G. P., 1236 Lakewood Dr., Vancouver, B. C.
Hopping, R., Dominion Entomological Laboratory, Vernon, B. C.
Jacob, J. K., Dept. of Entomology, Univ. of B.C., Vancouver, B. C.
Latta, R., U. S. Experiment Station, Sumner, Washington, U. S. A.
Leech, H. B., Box 308, Vernon, B. C.
Llewellyn-Jones, J. R. J., Mill Bay, Cobble Hill, Vancouver Island, B. C.
Marmont, L. E., Mallierville, B. C.
Mathers, W. G., Agricultural Bldg., Univ. of B. C., Vancouver, B. C.
Menzies, T. P. O., Vancouver City Museum, Vancouver, B. C.
Ruhman, M. H., Dominion Entomological Laboratory, Vernon, B. C.
Wilcox, J., Box 297, Alhambra, Calif., U. S. A.

100



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